



# Financing CCUS

How targeted policies can drive the industry

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# Summit Power Group



**Founded over two decades ago by former U.S. Secretary of Energy Donald Hodel and Chief Operating Officer of the Department of Energy Earl Gjelde**

- Headquartered in Seattle, Washington
- Staff on the ground in Texas, Pacific NW, Desert SW, Midwest, and Washington DC

## **Development, Ownership, & Asset Management:**

- Over 9,000 MW of electric power plants developed
- Total Summit-led projects in service or under contract represent over \$10B of investment

## **Summit's current principal business lines:**

- High efficiency natural gas-fired power plants
- Renewable energy projects including wind power projects & utility scale photovoltaic solar projects
- Carbon capture including post-combustion capture and coal gasification for EOR

## **Summit Carbon Capture:**

- Unique integration of market expertise around clean energy, CO<sub>2</sub>, oil, and power
- Strong relationships with leading global firms – technology, financial, asset owners
- Deep knowledge of regulation, policy, and public engagement

# Financing CCUS

- Status of CCUS in the United States power sector
- CCUS potential
- Energy policy frameworks
- Can targeted policies scale the CCUS industry?



# Status of CCUS in the Power Sector

1. Real progress with large projects
2. EOR is the main driver for the US business model in the near-term
3. Challenging commercial and policy environment

# Status of CCUS in the Power Sector

## 1. Real progress with large projects

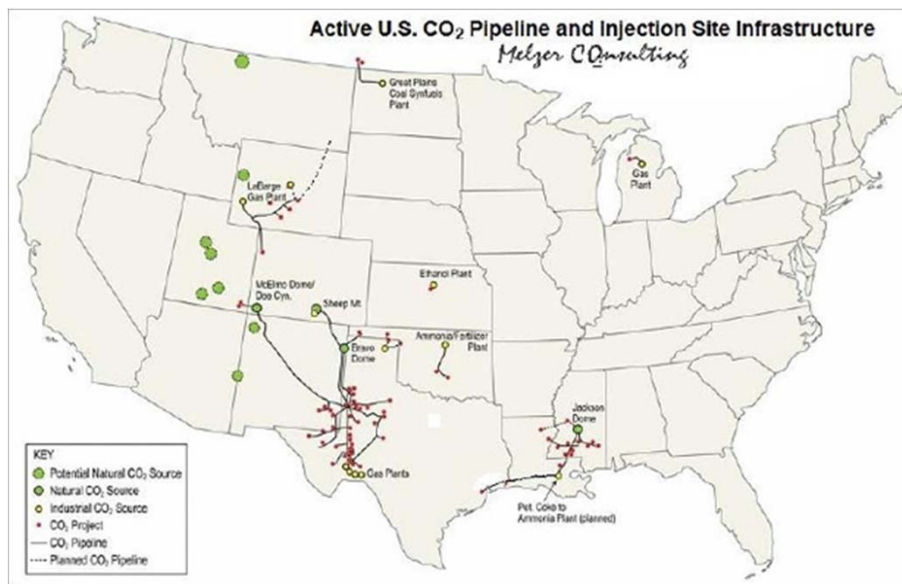
- Good demonstration, but all were subsidized
- Some disappointing delays and cancellations
- The real question is: what comes next?

Project	Type	Status	CO <sub>2</sub> Captured	Public Support
SaskPower Boundary Dam	Retrofit PCC	Online 2014	1 million tpy	Grant & Rate Recovery
NRG Petra Nova	Retrofit PCC	Online 2016	1.6 million tpy	Grant & Export Credit
Southern Company Kemper	New IGCC	Online 2016	3.5 million tpy	Grant & Rate Recovery
Summit TCEP	New IGCC	Under Development (2019)	2 million tpy	Grant & Export Credit
Others				

# Status of CCUS in the Power Sector

## 2. EOR is the main driver for the US business model in the near-term

- Large projects are targeting combined storage plus utilization model
- Commercial projects follow markets – i.e. it is difficult to capture benefits of CO<sub>2</sub> reductions in current power markets, so CO<sub>2</sub> sales help close the gap



# Status of CCUS in the Power Sector

## 3. Challenging commercial and policy environment

- Uneven energy policies lead to lack of market
- Lack of power industry enthusiasm
- Lack of public understanding
- Low oil prices

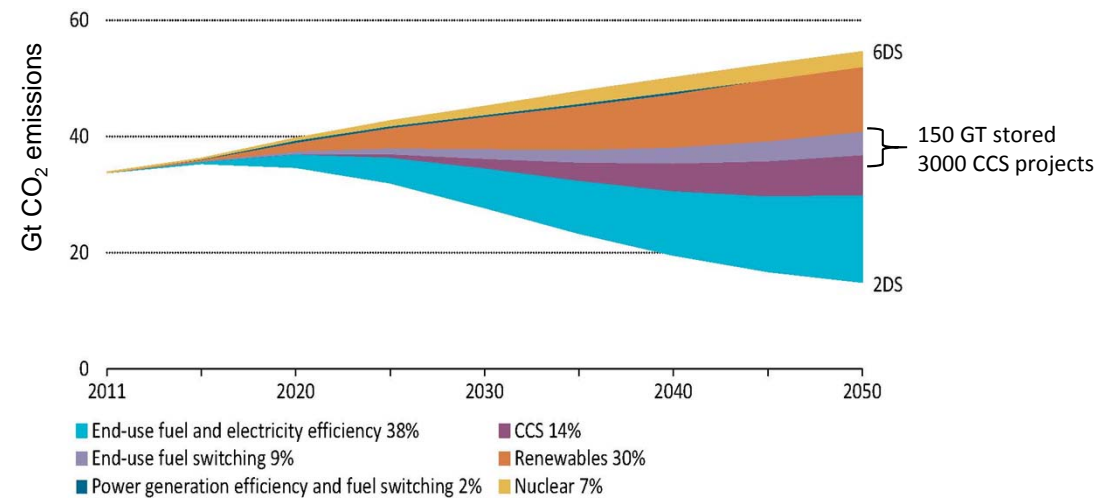
# CCUS Potential



## Important for Global Climate

- International Energy Agency concludes large contribution from CCS needed globally to meet climate targets
- Deployment of CCS must complement renewables, not substitute for them
- IPCC's Fifth Assessment Report (AR5) concludes that the availability of CCS is the most significant driver of both
  1. The ability to stabilize emissions and
  2. The cost of doing so

## International Energy Agency



Source: IEA Energy Technology Perspectives (2014)



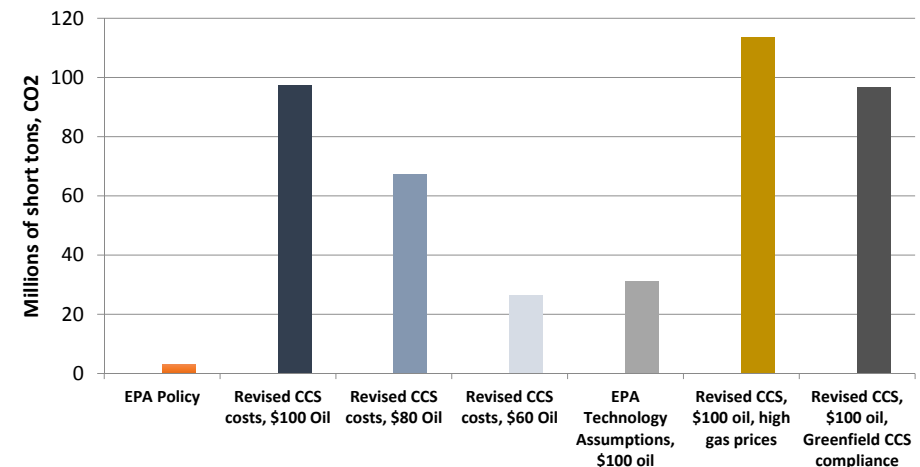
# CCUS Potential



## Cost-Effective Domestic Compliance Option

- CATF explored potential of CCS to deploy under the EPA Clean Power Plan
- Adjusted modeling assumptions from EPA analysis, utilizing the CATF-Charles River Associates commercial information
- Conclude CCS can be a large and cost-effective option in certain regions
- 97 million tpy captured from 10 GWs of coal capacity by 2030

Clean Air Task Force – Charles River Associates  
CO<sub>2</sub> Reductions per year (in 2030)

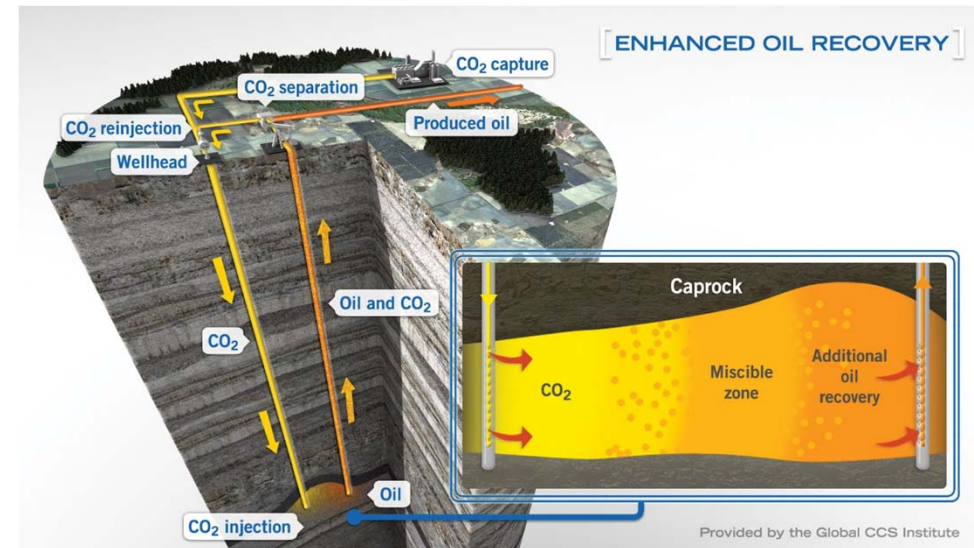


# CCUS Potential



## Strengthens US Domestic Energy Position

- Maintains a strong role for US coal and natural gas resources well into the future
- CO<sub>2</sub> EOR can bring significant new US oil reserves to market
- CO<sub>2</sub> EOR extends the life of existing oil fields and delays the need to develop new areas of development




# Energy Policy Frameworks

- Effective policy should aspire to meet simultaneous goals
  1. Clean → CO<sub>2</sub> reductions
  2. Affordable → for public budgets and consumers
  3. Reliable → predictable and diverse
  4. Parity → creating level playing field vs picking winners
- General policy levers
  1. RD&D Investments
  2. Fiscal Policy
  3. Standards

# Energy Policy Frameworks

## CCUS Public Policy Needs

- Carbon capture technologies are ready for commercial deployment
  - But the business case is difficult when compared against conventional natural gas combined cycle plants or currently subsidized renewables
  - How can policy help?
1. CCS needs to transition from policy framework of technology “push” to market “pull”
    - Simple
    - Scalable / Replicable
    - Effective
    - Refundable
    - Automatic
    - Appropriate value
  2. Tailor policies to address the specific challenges facing CCUS projects
    - Lack of differentiation in power markets
    - High end of cost/learning curve
    - Perceived risks in technology performance
    - Oil price volatility

# Energy Policy Frameworks

## Current Public Policy Snapshot

- DOE / NETL technology research program
- Clean Coal Power Initiative demonstration program
- DOE Advanced Fossil Loan Program
- 45Q Sequestration Tax Credits
- US EPA clarification on storage (UIC Class II v Class VI)
- American Carbon Registry voluntary methodology for CCUS
- Pending Clean Power Plan from US EPA

# Energy Policy Frameworks

## Important Development: EPA Clarification on UIC Transition

- In April 2015, US EPA officially released a statement of “key principles” regarding issue of transition from Class II EOR wells to Class VI storage wells
- Very significant development for commercial CCUS which mitigates a major uncertainty
- Framework for CCUS as compliance option in Clean Power Plan now exists:
  - Class II with GHG emissions reporting under Subpart RR

### EPA clarification highlights:

- ✓ Geologic storage of CO<sub>2</sub> occurs as part of EOR and can be permitted in Class II wells
- ✓ Anthropogenic CO<sub>2</sub> does not necessitate Class VI wells
- ✓ Class VI site closure not required for Class II wells



# Energy Policy Frameworks

## Federal CCS “Fiscal Policies” Under Consideration

- Investment Tax Credit (refundable)
- Sequestration Tax Credit (refundable)
- Private Activity Bonds
- Price Stabilization Support
- Master Limited Partnership (including the power plant)

# Obama Administration Proposal

- Creating a Carbon Dioxide Investment and Sequestration Tax Credit
  - ITC – Lowers the amount of total money a project needs to raise
    - 30% credit
    - Refundable
    - \$2B Authority
    - Application Based
    - Mix of new and retrofit, variety of technologies
  - STC – Creates an additional revenue stream
    - Refundable
    - Simple eligibility and claiming
    - \$50/ton for CO<sub>2</sub> sequestered and not beneficially used
    - \$10/ton for CO<sub>2</sub> sequestered and beneficially used
    - 20 years, indexed to inflation
- Suggested Improvements:
  - ITC: simplify eligibility, self-executing, and encourage similar projects not one-offs
  - STC: increase value of EOR CCUS (by reducing sequestration credit value or payout time)





# Private Activity Bond Proposal

- Expand PAB availability to CCS equipment
  - Well understood financing tool with deep existing market
  - Tax-exempt bonds are long term investments for mutual funds and individuals
  - Cheaper interest rates and longer tenors mean projects have more favorable hurdle rates
  - Expanding PAB's to CCS would cost taxpayers little
    - States already have volume caps for their PAB markets, CCS would simply be included as a new option

# Price Stabilization Support

- Senator Heitkamp S.1285, Coal with Carbon Capture and Sequestration Act – introduced May 2015
- Authorizes the Department of Energy to enter into binding 25 year contracts with CCUS projects to provide price stabilization support for electricity or CO<sub>2</sub> sold for commercial utilization
- Price stabilization can help mitigate the volatility in energy markets, reduce CCUS project risk, and lower project hurdle rates



# Master Limited Partnership Parity Act

- Straightforward adjustment to federal tax code that permits renewable energy and a CCUS power project to access the same tax-efficient equity funding that pipelines, oil companies, and timber producers have
- MLP markets are large and well-understood
- Could allow for lower cost of equity and lower hurdle rates for projects



# Other Options – Establish the Markets

- EPA Clean Power Plan
  - Ensure CCS is included in State Implementation Plans
  - Reward early action
  - Allow new CCS plants to support existing rule compliance (as renewables can)
- Refine Electricity Portfolio Standards
  - Create National Clean Energy Standard
  - Transition State RPS programs from Renewable to Low-Carbon
  - Distinguish procurement in programs between intermittent and baseload and include requirements for both
- Refine Fuel Standards
  - Transition Federal RFS from Renewable to Low-Carbon
  - Include CCS EOR in state “clean fuels” programs
  - Consider CCUS EOR crudes as options for future Aviation and Shipping commitments
  - Standardize life cycle calculations to ensure consistent treatment of alternatives
- Support standardized designs and FEED work

# Energy Policy Frameworks

- Systems Analysis
- It is critical to evaluate the overall pathway of low-carbon choices when making planning and procurement decisions
  - This is especially true in world of “a la carte” policies
- For example, how to compare intermittent against baseload options?
  - Levelized cost of energy is insufficient
  - Time of day and dispatchability drive value
- Backup costs + emissions must eventually be paired with intermittents
- Case studies: California & Germany

# Energy Policy Frameworks

California RPS Planning (from Energy and Environmental Economics, Inc, 2014)

- Major utility study explored the impacts of increasing RPS requirements in CA
- Diminishing returns on CO<sub>2</sub> reductions from increased investments in renewables

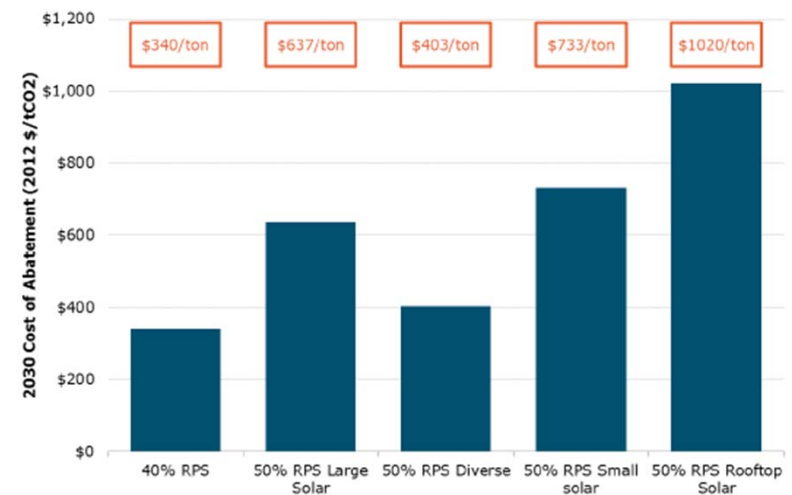
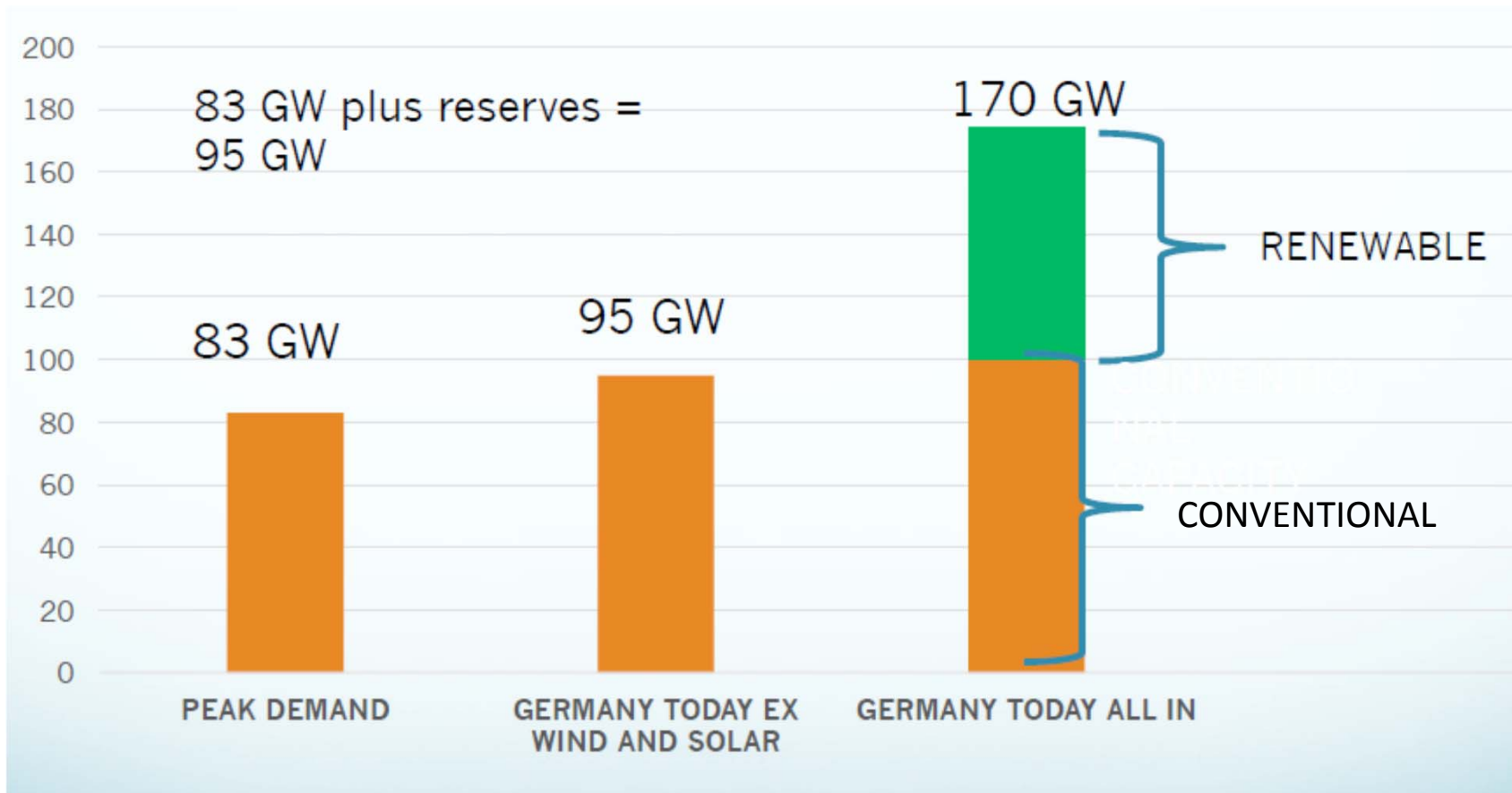


Figure 38: Implied cost of carbon abatement in 2030 for each Scenario relative to the 33% RPS Scenario

# Energy Policy Frameworks

Germany Capacity Today (courtesy CATF data)



# Can Targeted Policies Scale the CCUS Industry?



- Can we achieve long-term energy goals without baseload low-carbon options?
- Significant body of work suggests we can and should support CCUS deployment
- Cost competitiveness of CCUS is compelling when compared against appropriate alternatives
- Cost effectiveness over time can be greatly improved by targeted support for initial standardized commercial projects
  - As has been well demonstrated by success in wind and solar
  - Federal 1603 cash grant program alone had disbursed over \$20B in 4.5 years through 2014 (<http://www.platts.com/news-feature/2014/electricpower/us-solar-gains/index>)
  - Significant deployment and major decrease in solar PV costs as a result
  - Inclusion in standards won't raise costs, just potentially redirect investments